2013-2014 TRITICALE SWATH GRAZING REPORT

-A look at varietal differences in Triticale

CLEARWATER COUNTY AGRICULTURAL SERVICE BOARD

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Introduction

Following the success of the triticale plots in the 2012-2013 Swath Grazing Trials it was decided to further study the success of growing different varieties of this crop in Clearwater County.

Results from the original study showed that Triticale as a swath grazing crop was able to meet nutritional requirements of a cow in mid to late pregnancy and held its value well in the swath.

The Agricultural Service Board decided to run trial plots of five different varieties of Spring Triticale to compare them for quality, quantity and degradation over time.

Figure 1: View of the triticale trial plots

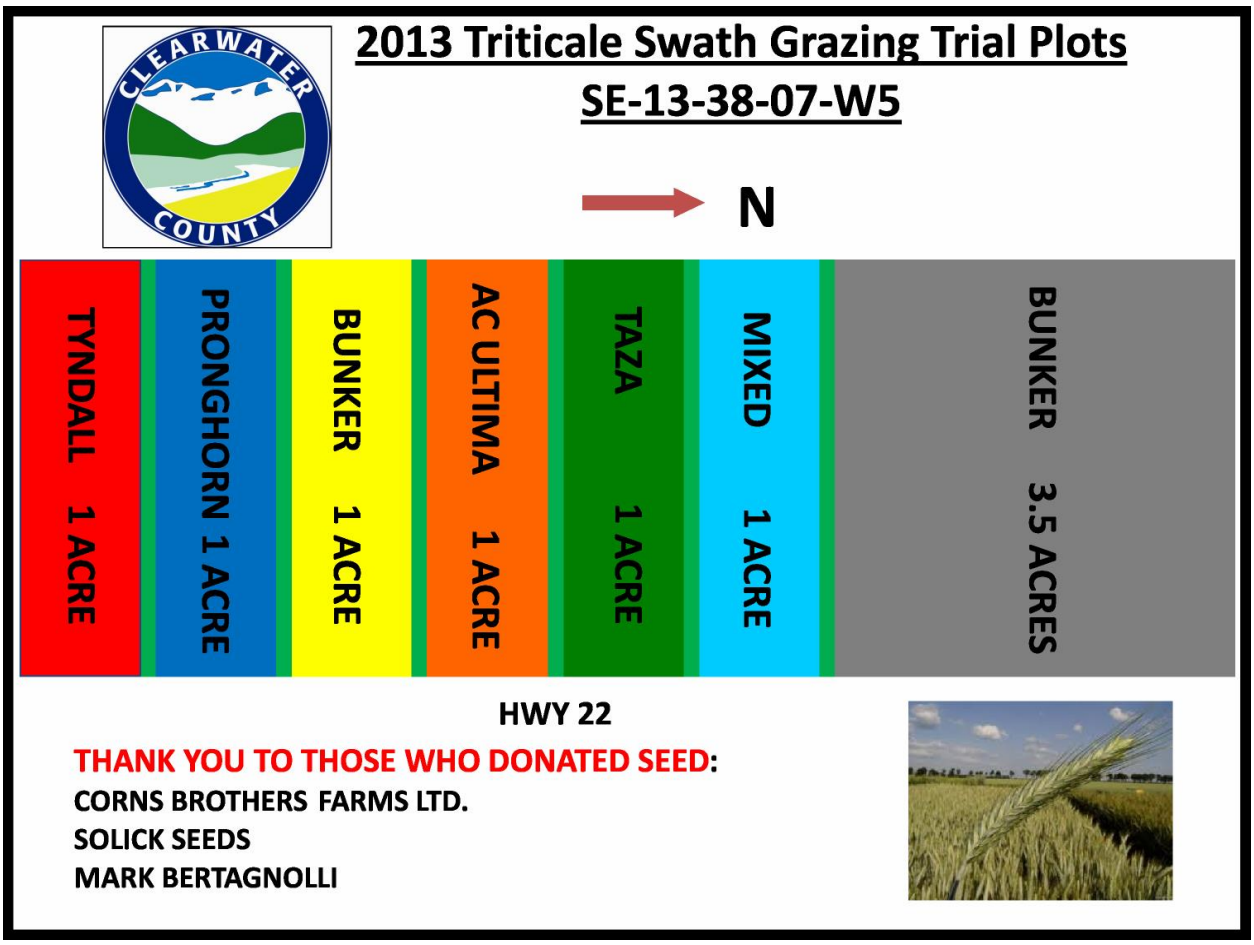

Figure 2: Layout of trial plot varieties

DESCRIPTION OF CLEARWATER COUNTY

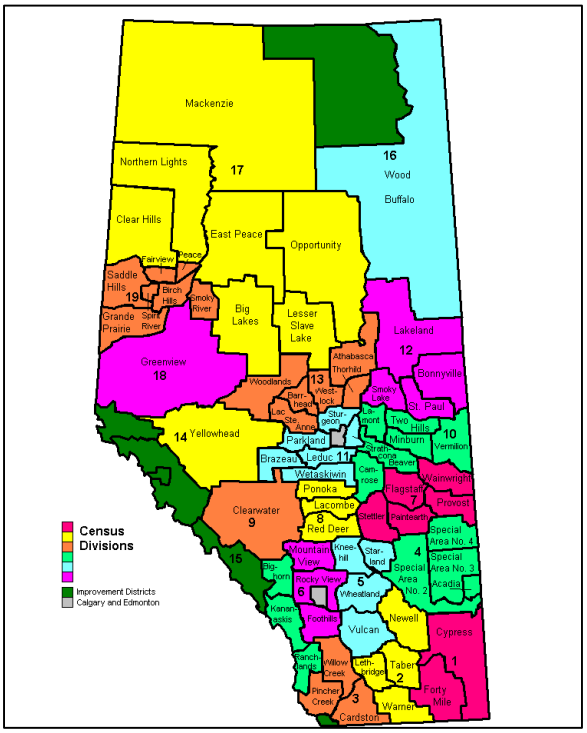

Figure 3 Counties in Alberta

Clearwater County is located in west central Alberta. Jasper and Banff National Parks border its western edge. Other bordering municipalities include Yellowhead County, Brazeau County, County of Wetaskiwin, Ponoka County, Lacombe County, Red Deer County , Mountain View County and the Municipal District of Bighorn.(See Figure 3). The total land mass of the County is 4,527,101 acres. Only 19% or 846,781 acres are suitable for agricultural use. Of this, more than 75% is used as improved pasture or native range, supporting the livestock industry. Less than 25% is used for the production of perennial forage and annual crops. The County is challenged by a short growing season of about 85-95 frost free days due to elevations of 1000m above sea level.

The average temperature for the May to September period is 11.9 ^{0}C. Hottest months are normally July and August with an average daytime temperature of 20^{0}C. Annual precipitation ranges between 500 and 550mm. The wettest month is typically July, which averages around 200mm.

Soils range from pockets of Black Chernozemics along the east central portion of the County to Dark Grey to Grey Luvisols across the central portions with Brunisols toward the western portions. Therefore although producers on the eastern side of the County may be lucky enough to be farming black soils, typically most of the agricultural land in Clearwater County is Grey Wooded with less than 10% organic matter. Statistics Canada reported in the 2011 census that the majority (45%) of farms in Clearwater County are beef cattle farms. There are 34,026 cows on 594 farms in Clearwater County.

Dates and Rates

The site chosen for the Triticale trial plots was the same as for the swath grazing trial plots of 2012. The location is on Mark Bertagnolli's farm on HWY 22 South between Rocky Mountain House and Caroline. SE-13-38-7 W5.

The previous crops were the trial plots of oats, canola, millet, field peas, barley and triticale. Pre seed burn off to control weeds and volunteer crops with 1L/ acre Vantage Plus Max was carried out on May 30th.

Soil tests were carried out on the trial plot area and fertilizer applied accordingly. (see appendix A for soil test result). The plots were cultivated and fertilized on June 5th and 6th. Fertilizer rate was 74lbs Nitrogen, 43lbs Phosphorous, 28lbs Potassium and 24lbs Sulpher. Weather conditions were cool and very wet. Plots were seeded with a John Deere 9350 hoe drill with direct seed openers. Seeding conditions were wet.

	Seed Rates	**June 7th 2013**	
Variety	**Recommended**	**Actual seed rates**	
Tyndall	123lbs/acre	142lbs/acre	
Pronghorn	146lbs /acre	142lbs/acre	
Bunker	194lbs/acre	204lbs/acre	
AC Ultima	125lbs/acre	131lbs/acre	
Taza	120lbs/acre	112lbs/acre	

Table 1. Triticale Seed rates

All the plots emerged on June 15th with no apparent difference in germination or vigour. June continued to be cool and wet but warmer temperatures arrived in

July although conditions remained wet. The average precipitation for May was 90mm and 16 degrees daytime high; June was 84mm with an average daytime temperature of 19 degrees C. The average precipitation for July was 109mm with an average daytime high of 21 ^{0}C. Normal for the period is 65mm, 87mm and 90 mm consecutively.

Weeds were predominantly lambs quarter, hemp nettle, chickweed and some volunteer crops from the previous trials. The weeds were sprayed with Tracker on July 8th at the 16 acres/jug rate. Weed control was excellent with no apparent setback of the Triticale.

A major hailstorm hit on July 14th, 2013 which severely damaged the crop as a whole. Leaves were shredded and plants were battered and rolled. By July 19th it looked like the crop would recover.

The varieties were monitored over the growing season and stages of production recorded.

TRITICALE VARIETIES

TYNDAL

Tyndal was developed by the Field Crop Development Centre in Lacombe and was registered in 2006. Tyndal is an awnletted (reduced awn expression) standard height triticale intended for use as a feed grain and conserved forage.

Figure 4: Tyndal crop

Tyndal has a good leaf and stem rust resistance, good test weight, early maturity, good lodging resistance and high forage yields. Tyndal has acceptable levels of disease resistance.

PRONGHORN

Pronghorn was developed by the Field Crop Development Centre, Lacombe and registered in 1995. Pronghorn has yields equal or superior to check cultivars. It is moderately susceptible to certain races of stem rust. Pronghorn is fully awned which may not make it as suitable to swath grazing as other varieties.

Figure 5: Pronghorn Crop

BUNKER

Bunker was developed by the Field Crop Development Centre in Lacombe and was registered in 2006. Bunker is awnletted (reduced awn expression). In four years of silage trials Bunker was higher yielding than Pronghorn (7%) and AC Ultima (3%).

Figure 6: Bunker crop

ULTIMA

AC Ultima originated from the International Maize and Wheat Improvement Centre triticale breeding Program. Ultima is one of the earlier maturing Spring varieties and is very resistant to leaf and stem rust.

Figure 7: Ultima Crop

TAZA

Taza was produced at the Field Crop Development Centre, Lacombe in 1994. It is a reduced awn variety with standard height. It is used as a feed grain conserved forage and for swath grazing. In trials Taza yields higher than Ultima and similar to Pronghorn. Taza has a good lodging resistance and is resistant to leaf and stem rust.

Figure 8: Taza Crop

RESEARCH CARRIED OUT ON PLOTS

The trial plots were monitored regularly and Zadoks Stage of Production recorded. Plots were monitored on July 24th, August 4th, August 19th, August 29th and September 16th.

Tyndal - July 24th Stage of Production

1. Plot looking sparse compared with others
2. Less stooling. Only 2-3 tillers per plant.
3. 3-4 nodes detectable
4. 16-18" tall to end of stem.
5. 80% with Flag elongated and ligule visible
6. Swollen boot
7. GS 44/45
8. Fewer leaves. Lots of dead leaves on ground. Seems to be worse hit by the hail.

Figure 9: Tyndal 24-07-2013 GS 44/45

PRONGHORN - July 24th Stage of Production

1. Plot looking thick and lush.
2. 5-6 tillers per plant.
3. Leafy
4. Tillers almost as tall as main stem
5. 3rd node barely detectible
6. 12” tall to end of stem.
7. 80% with Flag just emerging
8. 20% with flag elongated
9. Very early boot
10. GS 39/40

Figure 10: Pronghorn 24-07-2013 GS 39/40

BUNKER - July 24th Stage of Production

1. Plot looking thick and lush.
2. 6-8 tillers per plant.
3. Leafy
4. Tillers almost as tall as main stem
5. 3 node barely detectible
6. 16-18" tall to end of stem.
7. Flag leaf emerging, ligules not visible
8. Flag leaf not extended
9. Very early boot
10. GS 39

Figure 11: Bunker 24-07-2013 GS 39

ULTIMA - July 24th Stage of Production

1. Plot darker green.
2. Less tillering, 2-4 tillers per plant.
3. Narrow long leaves
4. 3 nodes easily detectible
5. 18-19” tall to end of stem.
6. Flag leaf fully emerged and ligules visible
7. Swollen boot
8. GS 43-44

Figure 12: Ultima 24-07-2013 GS 43-44

TAZA - July 24th Stage of Production

1. Thick and lush
2. Light green colour
3. Good tillering. 6-8 tillers
4. 12-14” high to end of stem
5. 3 nodes detectible
6. 75% flag leaf fully emerged and ligules visible
7. 25% flag just emerging
8. early boot
9. GS 41

Figure 13: Taza: 24-07-2013 GS 41

Discussion on July 24th Inspection

STAGE OF PRODUCTION RANKING JULY 25TH 2013

1. **TYNDAL** **G.S 44/45**
2. **ULTIMA** **G.S. 43-44**
3. **TAZA** **G.S. 41**
4. **PRONGHORN** **G.S. 40**
5. **BUNKER** **G.S. 39**

The visual inspection showed that on July 24th Tyndal and Ultima were furthest along in maturity with Bunker being the least mature. The more mature varieties showed they were less leafy, had stooled less and were sparser than the less mature varieties.

Tyndal – August 4th Stage of Production

1. Plot still looking sparse compared with others
2. Recovering well from most significant hail damage
3. 24” tall
4. ½ of head emerged
5. GS 55

Figure 14: Tyndal 04-08-2013 GS 55

PRONGHORN - August 4th Stage of Production

1. Plot looking less lush now.
2. Leaves not as thick as Bunker
3. 28”” tall to end of stem.
4. More advanced than Bunker
5. ¼ of head emerged.
6. G.S 53

Figure 15: Pronghorn 04-08-2013 GS 53

BUNKER - August 4th Stage of Production

1. Plot looking thick and lush.
2. Most Leafy of all plots
3. Broad leafy leaves, most promising looking for forage
4. Majority plants in first spikelet of head visible
5. Most immature of all plots.
6. 32” tall to end of spike.
7. GS 50

Figure 16:Bunker 04-08-2013 GS 50

ULTIMA - August 4th Stage of Production

1. Thinner plant
2. Narrow long leaves
3. Less leaves than other varieties
4. 29” tall to end of stem.
5. Emergence of head complete
6. GS 59

Figure 17:Ultima 04-08-2013 GS 59

TAZA - August 4th Stage of Production

1. Thick and lush
2. Thicker leaf like Bunker
3. 32” high to end of stem
4. ¼ of head emerged
5. GS 53
6. Similar in maturity to Pronghorn but bigger leaves like Bunker.

Figure 18:Taza 04-08-2013 GS 53

Ranking for maturity AUGUST 4TH

1. **ULTIMA** **G.S 59**
2. **TYNDAL** **G.S.55**
3. **PRONGHORN AND TAZA** **G.S. 53**
4. **BUNKER** **G.S.50**

By August 4th Bunker and Taza looked the most promising for forage with the tallest stems and leafy lush plants. Ultima was the most mature and still looked the most sparse of all plots but was recovering well after the hail. The Tyndal plot seemed to be hit the hardest from the storm. Although Pronghorn was nearly as tall as Bunker it was not as leafy at this stage.

Tyndal – August 19th Stage of Production

1. Plot still looking sparse compared with others
2. Heads as large as others (4 inches) Not quite as fat as Bunker.
3. Reduced awns similar to Bunker
4. Silvery green colour
5. Shorter variety at 46 inches
6. Most mature . Pollination complete
7. GS 69

Figure 19 :Tyndal 19-08-2013 GS 69

PRONGHORN - August 19th Stage of Production

1. Plot looking yellow/green.
2. Leaves not as thick as Bunker
3. One of shortest varieties at 45 inches.
4. Fully awned
5. Head 4 inches long but not quite as fat as bunker but including awns, longest of all varieties
6. Awns thick and spikey
7. Pollination ¾ complete
8. GS 67

Figure 20: Pronghorn 19-08-2013 GS 67

BUNKER - August 19th Stage of Production

1. Plot tallest of all at 55 inches
2. Most Leafy of all plots
3. Large heads about 4” tall and 7/8” wide
4. Reduced awns. Length of head including awns 5”. Shortest awns
5. GS 67 about ¾ pollination

Figure 21: Bunker 19-08-2013 GS 67

ULTIMA - August 19th Stage of Production

1. Thinner stalk
2. Narrow long leaves
3. Yellow/green colour
4. Shorter variety at 45 inches.
5. Longer awns
6. Pollination complete
7. GS 69

Figure 22: Ultima 19-08-2013 GS69

TAZA - August 19th Stage of Production

1. Silvery green
2. Thicker leaf like Bunker
3. 48 " tall
4. ½ pollination
5. GS 65
6. Heads 4" long and similar to Pronghorn in fatness
7. Reduced awns.

Figure 23: Taza 19-08-2013 GS65

Ranking for maturity AUGUST 19th

1. **ULTIMA** **G.S 69**
2. **TYNDAL** **G.S.69**
3. **BUNKER AND PRONGHORN** **G.S. 67**
4. **TAZA** **G.S.65**

It was interesting to see how maturity stages began to change as the varieties developed. Although Ultima and Tyndal were still the most mature Bunker and Pronghorn had both moved up leaving Taza at the least mature stage on this date. Bunker seemed to have the largest heads and still looked the densest of all plots.

Tyndal – August 29th Stage of Production

1. Plot still looking sparse compared with others
2. Heads as large as others (4 inches) Not quite as fat as Bunker or Taza.
3. Reduced awns similar to Bunker
4. Silvery green
5. Shorter variety at 46 inches
6. Heads empty
7. Some anthers

Figure 24: Tyndal 29-08-2013 GS 70

PRONGHORN - August 29th Stage of Production

1. Plot looking yellow/green.
2. Leaves not as thick as Bunker
3. 52 inches.
4. Biggest heads
5. Head 5 inches long but not quite as fat as bunker but including awns longest of all varieties
6. 7 inches with awns. Awns thick and spikey
7. No anthers to be seen
8. Just starting to fill. Watery

Figure 25: Pronghorn 29-08-2013 GS 72

BUNKER - August 29th Stage of Production

1. Plot tallest of all at 56 inches
2. Most leafy of all plots
3. Large heads about 4” tall and 7/8” wide
4. Reduced awns. Length with awns 5”. Shortest awns
5. Just starting to fill. Early watery milk
6. Anthers still showing (about half)

Figure 26: Bunker 29-08-2013 GS 71

ULTIMA - August 29th Stage of Production

1. Thinner stalk
2. Narrow long leaves
3. Yellow/green colour
4. Shorter variety at 45 inches.
5. Short heads 3 inches
6. Longer awns
7. Just barely starting to fill. Watery

Figure 27: Ultima 29-08-2013 GS70

TAZA - August 29h Stage of Production

1. Silvery green
2. Thicker leaf like Bunker
3. 50 " tall
4. Barely starting to fill
5. Most heads empty
6. Heads 4" long as similar to Pronghorn in fatness
7. 51/2-6" with awns .

Figure 28: Taza 29-08-2013 G69

Ranking for maturity AUGUST 29th

1. **PRONGHORN** **G.S 72**
2. **BUNKER** **G.S.71**
3. **TYNDAL AND ULTIMA** **G.S.70**
4. **TAZA** **G.S.69**

In a period of two weeks maturity levels changed again. At the end of August Pronghorn and Bunker had moved up into the most mature spots leaving Taza as the most immature. As the watery stage began developing in some varieties the plots were watched very closely as swathing was planned for the early dough stage.

RESULTS

The plots were swathed on September 16th. Some of the plots had lodged, the worst being Bunker which had been the lushest throughout the trial. Before swathing took place yield was calculated by taking clippings of each variety using a half meter square quadrant. Samples were assessed for maturity and samples were taken from both lodged and unlodged areas and results tabulated to reflect the percentage lodging in the plot.

Figure 29: Marty Winchell preparing to carry out yield tests

Figure 30: Pronghorn plot showing 10% lodging

Figure 31: Ultima showing 7.5% lodging

Figure 32: Bunker showing 20% lodging

Figure 33: Difference between Bunker and Ultima for lodging

Ranking for maturity September 16th 2014

At the time of swathing the varieties were at the following maturity levels.

1.	**BUNKER**	**G.S 85**	**Soft-mid dough**
2.	**PRONGHORN AND TAZA**	**G.S.83**	**Early dough**
3.	**TYNDAL AND PRONGHORN**	**G.S.80**	**Late milk-early dough**

At the time of swathing Bunker had matured the most quickly of all varieties and was coming into the mid dough stage compared to Taza and Pronghorn in the early dough and Tyndal and Ultima in the late milk/early dough stage. It was interesting to see how Bunker and Taza were the later maturers all the way through the trial but in the last 3 weeks moved up substantially.

Table 34: Recording stage of maturity before swathing.

Testing on Trial Plots

The first testing was carried out on September 16th when the plots were swathed. Each plot was tested for yield and nutritional value and visually inspected for lodging. Pronghorn, Bunker, and Ultima all showed signs of lodging at 10% , 20% and 7.5% respectively. Tyndal and Taza showed no signs of lodging at all. The yield was measured using a $0.25m^2$ quadrant that was applied in 3 areas to each plot and the amount of forage from each weighed. Averages were then calculated and adjusted to reflect Tonnes per Acre. Lodged areas were also represented in the testing.

Final Results are shown in Table 2. It can be seen that Taza was the highest yielding and Ultima the lowest

TABLE 2 :TRITICALE YIELD RESULTS SEPTEMBER 16TH 2013

VARIETY	AVERAGE OF UNLODGED SAMPLES	LODGED	LODGING	DM Yield taking lodging into account	TDM/acre
TAZA	1.18KG		0	0.480kg (1.06lbs)	7.8T
PRONGHORN	1.04KG	1.08KG	10%	0.424kg (.933 lbs)	6.9T
TYNDAL	.92KG		0	0.385kg (.85lbs)	6.2T
BUNKER	.78KG	1.15KG	20%	0.404kg (.83lbs)	6.1T
ULTIMA	.73KG	.95KG	7.50%	0.352kg (.77lbs)	5.7T

Samples from each test plot were sent away for testing to Parkland Laboratory in Red Deer. Sampling took place in three different locations in the plots to allow for a representative sample. Sampling took place on September 16th, January 28th and April 30th. Due to the large amounts of snow over the winter, the plots were not able to be swath grazed and so we were able to test the feed over the entire winter.

RESULTS and DISCUSSION

Tables 4 and 5 show the results for the 5 trial plots for the 3 test dates. The protein results at time of swathing were lower than the protein results for the previous year's trial. The Triticale was swathed at early to mid-dough, which was more mature than previous trial plots. Protein levels from 8.5% to 9.0% are adequate to maintain a cow in early and mid pregnancy but would not be nutritionally adequate for a cow lactating and raising a calf. However, by cutting later and waiting for the grain to be in the dough stage allowed for increased energy levels. This is seen in the TDN results, which range from 65 to 68%, which is adequate for a cow even after calving. (See table 3)

STAGE OF PRODUCTION	Protein required (Dry Matter)	TDN required (dry matter)
Mid-pregnancy	**7%**	**55%**
Late-Pregnancy	**9%**	**60%**
After Calving	**11%**	**65%**

Table 3: Cow Nutritional Requirements for Stage of Production

	Table 4: 2013-2014 TRITICALE VARIETY TEST RESULTS					
	MOISTURE %	PROTEIN %	ADF%	NDF%	TDN	D.E (Mcal/kg)
PRONGHORN						
September 13th	59.36	8.5	30.8	49.1	65.9	2.9
January 28th	31.8	8.4	36.0	56.4	62.3	2.75
April 30th	57	8.5	44.4	61.8	56.4	2.49
ULTIMA						
September 13th	52.76	8.3	27.5	43.3	68.0	3.0
January 28th	33.3	8.5	35.3	55.8	62.8	2.77
April 30th	50.9	7.6	40.7	61.8	59	2.6
BUNKER						
September 13th	54.5	8.3	33.4	49.7	64.2	2.8
January 28th	41.4	8.2	39.0	58.9	60.2	2.66
April 30th	55	8.6	43.5	65.1	57	2.51
TYNDAL						
September 13th	58.1	9.1	30.0	46.5	66.5	2.93
January 28th	29.6	8.5	32.0	51.1	65.1	2.87
April 30th	46.2	8.7	42.3	61.6	57.8	2.55
TAZA						
September 13th	59.2	8.9	31.8	48.3	65.2	2.88
January 28th	26.9	8.3	37.0	57.3	61.6	2.72
April 30th	58.4	9.3	39.9	56.5	59.5	2.63

2013-2014 TRITICALE VARIETY TEST RESULTS Table 5: continued					
	Rel. Feed value	dry matter intake	Net energy lactation	Net energy gain	Net energy maintenance
PRONGHORN					
September 13th	123	2.44	1.53	0.87	1.57
January 28th	100	2.13	1.47	0.83	1.53
April 30th	82	1.94	1.37	0.76	1.46
ULTIMA					
September 13th	145	2.77	1.56	0.89	1.59
January 28th	102	2.15	1.48	0.84	1.54
April 30th	86	1.94	1.41	0.79	1.49
BUNKER					
September 13th	118	2.42	1.5	0.85	1.55
January 28th	92	2.04	1.43	0.81	1.51
April 30th	79	1.84	1.38	0.77	1.47
TYNDAL					
September 13th	131	2.58	1.54	0.88	1.58
January 28th	117	2.35	1.52	0.86	1.56
April 30th	84	1.95	1.39	0.78	1.48
TAZA					
September 13th	123	2.48	1.52	0.86	1.56
January 28th	98	2.09	1.46	0.82	1.52
April 30th	95	2.13	1.42	0.8	1.5

Requirements for Stage of Production

As can be seen from Table 4 all the varieties were quite similar for Protein and Energy. It would be hard to say which variety was nutritionally superior, especially considering samples were taken at random from each plot. Testing was also carried out in January and April and it is very impressive to see how the nutritional quality holds over time. It can be seen that even after sitting in the field over winter for 6 months the protein and energy levels remained surprisingly similar compared with the day of swathing.

It is important to note the change in NDF over time. NDF is the most difficult part of forage for cows to digest. NDF is a measure of the fiber content in a feed and represents the minimally digestible cell walls, lignin, cellulose and hemicellulose in the plant cells. NDF is important when considering cattle rations because it is a limiting factor in the dry matter intake capacity of a cow so as NDF increases; dry matter intake decreases. This makes it harder for the cow to fulfill her nutritional requirement. As a rule nutritionists like to see NDF below 55% and it can be seen that most of the varieties were close in January but by April NDF mostly had increased to above 60%, apart from Taza which remained pretty steady at 56.5%. It would be important to watch cows' condition when feeding Triticale that had stayed in the swath for a lengthy time period. This is true of all swath-grazing crops.

CONCLUSION

The Triticale trial plots performed very well in both yield and nutritional value. By waiting to swath when the crop was in the early to mid-dough stage, yield increased over previous trials by about 2 tonnes per acre. Energy levels also increased by swathing at a higher maturity level but protein rates had decreased. This being said, nutritionally the plots showed they could maintain a cow in early, mid and late pregnancy but protein would have to be supplemented for post calving.

All plots held their nutritional value well from September to April, which was very impressive. NDF increased as expected and would be a factor to consider when feeding cattle on swaths that had remained in the field over winter. Cow condition should be monitored if feeding the swaths later in the winter/early spring.

Although all varieties performed well it could be argued that Taza had the edge over the other varieties for a combined value of yield, nutritional value, ability to hold its value in the swath, and lodging resistance.